Substrate Metallization Considerations for Soldering

Special Consideration when using an Indium-Containing Alloy on Copper

Copper and high copper alloys diffuse into indium, which forms a copper-indium intermetallic that may compromise the mechanical integrity of the joint.

Copper diffuses into indium even at room temperature when solid, a process known as solid state diffusion. The copper-indium intermetallic can result in a weakening of joint strength and may result in joint failure under certain circumstances. Because this phenomenon is a function of temperature and time, the weakening effect of the diffusion may not be immediately evident. One effective method to prevent this diffusion is to have a barrier layer of a minimum of 50 microinches of nickel plated between the copper and indium. Metallizations, such as gold, can then be plated on top of the nickel to create a more solderable surface.

Reference: Effect Of Au On The Reliability Of Fine Pitch Surface Mount Solder Joints by Judith Glazer (Hewlett Packard Company, Palo Alto, California) and Pamela A. Kramer and J.W. Morris, Jr. (Department of Material Science and Mineral Engineering, University of California and Materials Science Division Lawrence Berkeley Laboratory, Berkeley, California)